

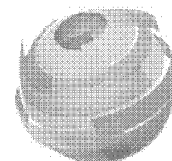
Power Supply Committee - Consider Natural Gas Supply Plan for 2020-2024

Case No. 21-30725

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Brazos Electric Cooperative 2020 – 2024 Natural Gas Supply Plan September 2020



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Brazos Electric Cooperative 2020-2024 Natural Gas Supply Plan

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DISCLAIMER

ACES has prepared this report based upon information provided by Brazos Electric Cooperative and information obtained from other sources considered to be reliable. ACES makes no representations or warranties as to the accuracy of any data used in the preparation of this report. Brazos Electric Cooperative is cautioned that reliance upon this information and the underlying assumptions for conclusions, decisions, or strategies involves risks and uncertainties. ACES cannot give any assurances that actual results will be consistent with the projections in this report. This report contains confidential and proprietary information and should not be disclosed without the express written consent of Brazos Electric Cooperative and ACES.

1 Executive Summary

ACES prepared the following natural gas supply plan to meet Brazos Electric Power Cooperative, Inc.'s (Brazos) projected Fall 2020 through 2024 natural gas consumption. The plan was prepared based on current estimates of natural gas consumption along with peak demand requirements. The following sections cover Forecast Consumption, Transportation, Storage Services, Analysis, and Recommendations/Action Items. Long Term/Further Considerations. Also attached at the end of the document:

Appendix A – NAESB Current Contracts
Appendix B – Brazos Pipeline Map
Appendix C – Brazos Electric's Natural Gas Fired Generation
Appendix D – Projected Average Consumption
Appendix E – Brazos PGM Yard Map

ACES will update this natural gas supply plan on an annual basis.

In the past year, Brazos has made changes two-fold. On the physical operations side, changes have been made on the Worsham Steed line to allow for much higher flows to Jack County. These increases allow for flows of over 150,000 MMBtu directly to Jack County, which has changed how natural gas is procured and flowed on a daily basis. In regards to storage and transportation contracts, Brazos has extended the interruptible transportation on Atmos for a term of three years which will be the primary source of transportation for Johnson County and the Miller fleet. Also, Brazos has increased and extended services at Worsham Steed through October 31, 2024. Firm transportation of 25,000 MMBtu/day and firm storage with a maximum storage quantity of 200,000 MMBtu in the summer (120,000 MMBtu for winter) has been secured at Worsham Steed. Firm storage at Hill Lake has also been agreed upon through October 31, 2023, with an MSQ as high as 100,000 MMBtu during the summer, ratcheting back to 60,000 MMBtu.

At the end of October 2020, the Enterprise firm transportation will expire. While Enterprise may still be needed at times for pressure reasons, the increased Worsham flexibility and flows will allow Enterprise quantities to be decreased and potentially eliminated.

2 Forecast Consumption

This natural gas supply plan utilizes forecast generation data from ACES' Portfolio Modeling and Portfolio Strategy groups, and is based on forward curves dated September 11, 2020. Figure 1 shows the projected average daily consumption volumes based on Brazos' most recent monthly Portfolio Position Report and Appendix D is a chart that represents a monthly volumetric estimate of consumption.

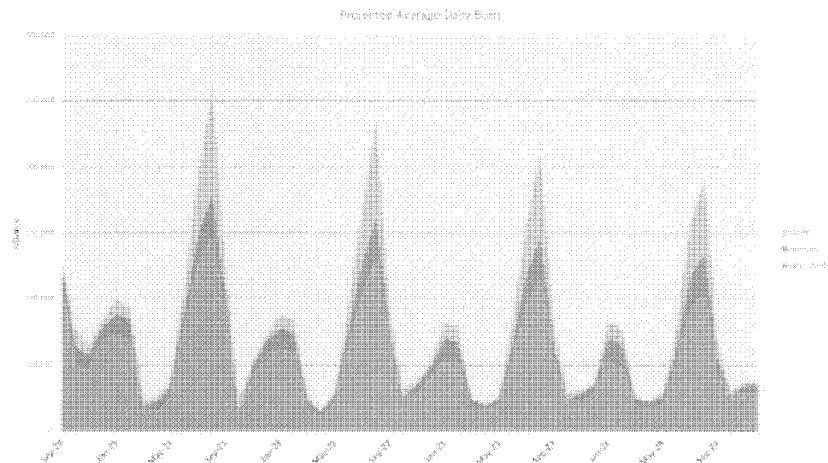
Figure 1. Projected Average Daily Consumption (MMBtu/day)

Figure 2 displays the daily peak capacity volumes based on the capacity at each of the natural gas-fired plants.

Figure 2. Daily Peak Consumption (MMBtu/day)

	Jack County	Johnson County	Miller	Total
2020	208,000	53,000	95,000	356,000
2021	208,000	53,000	95,000	356,000
2022	208,000	53,000	95,000	356,000
2023	208,000	53,000	95,000	356,000
2024	208,000	53,000	95,000	356,000

3 Transportation

ACES identified the volumes of firm pipeline capacity that Brazos Electric has secured for 2020 through 2024, as shown in Figure 3:

Figure 3. Firm Pipeline Capacity (MMBtu/day)

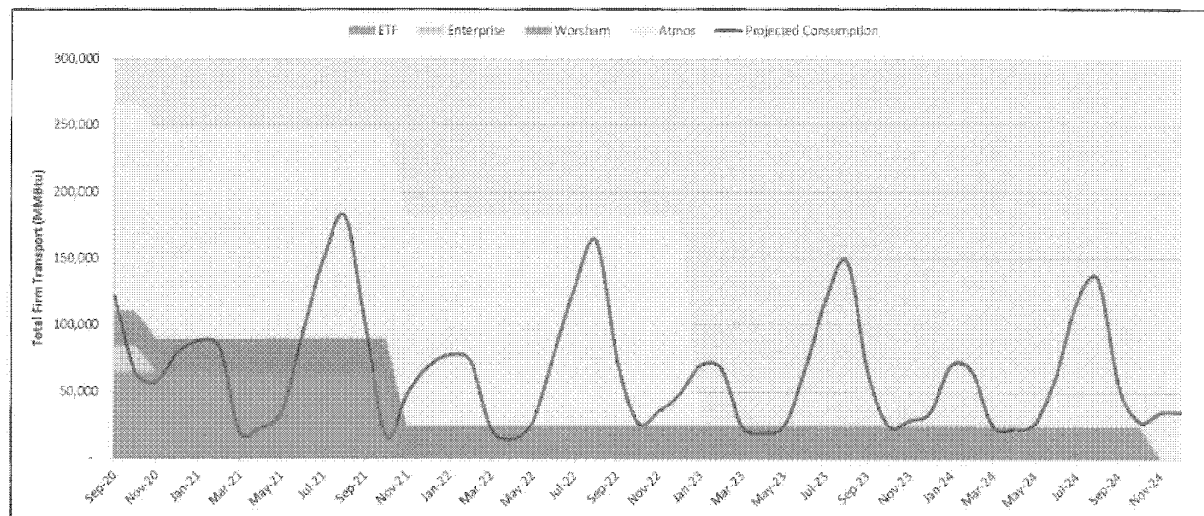
Firm Transportation		
Pipeline	Volume	Expiration
Enterprise	20,000 MMBtu/day	October 31, 2020
Energy Transfer	65,000 MMBtu/day	October 31, 2021
Worsham Steed	25,000 MMBtu/day	October 31, 2024
Total Firm Deliverability	110,000 MMBtu /day	

Interruptible Transportation		
Pipeline	Volume	Expiration
Atmos	156,000 MMBtu/day	December 31, 2022

Although the chart above shows only 110,000 MMBtu of firm transportation, additional volumes can be secured as a delivered product to cover the deficit at Jack County. Worsham Steed's volume can reach as high as 150,000 MMBtu/day, while Enlink can also flow up to 55,000 MMBtu/day. Under the current daily offering and operations of the Jack County units, specifically the increase in capacity from Worsham Steed, the usage frequency of supply from Enlink has diminished. This is both due to liquidity and economics on the Enlink supply.

In Figure 4, Brazos' average daily consumption is compared to the current firm natural gas transportation services. The deficit shown below will be partially supplied once the Enterprise Transportation contract is renegotiated and renewed. In addition to this, gas supplies on Worsham Steed can be purchased on a delivered basis which will also help fill the deficit seen below.

Figure 4. Total 2020 - 2024 Natural Gas Daily Transportation (MMBtu/day)



* Projected Consumption includes capacity of Johnson County and Jack County only.

4 Storage Services

Figure 5 shows the natural gas storage capacity and park & loan services that Brazos has in place for 2020 through 2024:

Figure 5. Storage and Park and Loan Capacity (MMBtu/day)

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Storage					
Pipeline	Injection	Withdrawal	Max Capacity	\$/MMBtu*	Expiration
Worsham Steed - Summer	40,000 MMBtu/day	40,000 MMBtu/day	200,000 MMBtu	\$0.05 + 1.5%	10/31/2024
Worsham Steed - Winter	40,000 MMBtu/day	40,000 MMBtu/day	120,000 MMBtu	\$0.05 + 1.5%	10/31/2024
Hill Lake - Summer	20,000 MMBtu/day	20,000 MMBtu/day	100,000 MMBtu	\$0.05 + 1.5%	10/31/2024
Hill Lake - Winter	20,000 MMBtu/day	20,000 MMBtu/day	60,000 MMBtu	\$0.05 + 1.5%	10/31/2024

Park and Loan					
Pipeline	Park	Loan	Max Capacity	\$/MMBtu*	Expiration
ETF	20,000 MMBtu/day	20,000 MMBtu/day	Negotiated**	Negotiated**	N/A
Atmos	25,000 MMBtu/day	25,000 MMBtu/day	Negotiated**	Negotiated**	N/A

*\$/MMBtu costs vary based on volume, etc. Highest costs displayed for reference. All costs shown in Figure 5 are variable. Reservation (fixed periodic demand fees) charges not included.

**Atmos and ETF PAL rate negotiated daily. Rates and max capacity can range based on time of year, duration of park/loan, or conditions on the pipe. Rates are expected to range from \$0.15 - \$0.25.

Figure 6. Reservation Costs of Storage / Park and Loan

*Energy Transfer & Enterprise varies monthly depending on number of days.

Monthly Reservation Charges				
Pipeline	Reservation		Other Charges	
Atmos (S & T)	\$	-	\$ 900.00	Meter Fee
Enterprise *	\$	60,833.40		
ETF *	\$	138,395.99		
Worsham Steed (T-Port)	\$	50,000.00		
Worsham Steed (Storage)	\$	57,000.00		
Hill Lake (Storage)	\$	28,500.00		
Total	\$	334,729.39		

With the heavy growth of renewable energy in ERCOT, it has become more difficult to forecast clearings than in previous years. Due to this, last year Brazos subscribed to additional storage services both at Hill Lake Storage as well as Worsham Steed storage. On a daily basis, 60,000 MMBtu can be either injected or withdrawn from storage. This flexibility is extremely valuable as it can be sculpted on an hourly basis to minimize hourly charges on specific pipelines. In addition, it can be withdrawn during peak hours to limit pulling the pressure of the system at Jack County down too quickly.

5 Analysis

After analyzing Brazos' expected peak consumption and transportation capacity, ACES concluded there is sufficient transportation for the Jack, Johnson, and Miller units. Although it is less likely that the units will be dispatched to peak capacity each day, it is necessary to plan to have sufficient firm transportation to supply Jack County and Johnson County for peak daily consumption. Without firm transportation, it could be challenging to secure firm delivered gas supply on a peak day to meet Brazos' needs.

Brazos' current transportation agreement with Energy Transfer is set to expire within the upcoming year. Current model runs show a decrease in consumption for both Johnson County and the Miller fleet

in the years to come. Due to the improvements which led to increased flow capability from Worsham Steed directly to Jack County, it may be possible to reduce or entirely terminate firm transportation on ETF.

Because of the importance of line pack for the Jack Units it is necessary to make sure there is sufficient supplies available to manage the current operational configuration and ACES will continue to work with Brazos to make sure that supply options are optimized.

Pipeline Transportation, Operationally Flexible Services, and Storage Service

- Brazos' historical capacity factors have been high enough to support subscribing to firm pipeline transportation instead of buying mostly delivered supply. Brazos has been able to negotiate discounted transportation rates from the pipelines serving their facilities. Currently, none of these pipelines can serve 100% of the Brazos load; therefore, Brazos will likely always have transportation capacity from more than one pipeline. The allocation between pipelines will be based on the operational flexibility and economics of serving the Brazos generators. Having capacity from several pipelines reduces the risk in relying on a single supply source. Not only is the supply risk reduced but the operational risk is as well. Completely relying on one or two sources poses a risk if any compressor or pipeline issues arise also.
- The peaking units at Miller have a very low capacity factor. Firm transportation demand charges on low capacity factor units equate to high cost gas transportation on a dollar per MMBtu basis, which translates to higher generation costs. Since a portion of the Miller units can generate by substituting oil and firm gas deliveries, firm transportation is not necessary or recommended for the Miller units.
- Brazos often consumes gas on a non-ratable schedule (more gas consumption on-peak than off-peak) and as a result, there will always be a need for pipeline or storage services to manage the hourly load variance. Pipelines have provided highly reliable operational flexibility on an interruptible basis; however, as witnessed during the Polar Vortex winters ago and the cold blast in the winter of 2017-2018, there is limited capacity to provide this on extreme days. Subscribing to firm hourly services allows the pipelines to reserve this capacity for customers to have when needed. Worsham Steed storage provides hourly flexibility to withdraw gas directly to Jack County as well as into Atmos, ETF pipeline, or Enterprise. Hill Lake storage also provides hourly flexibility to withdraw gas into ETF, Atmos, and Enterprise also.
- Brazos has the need for storage, as well as park and loan contracts, to provide additional flexibility to manage their power supply portfolio. The structure of the nodal market in ERCOT has increased the demand for greater flexibility from both Johnson County and Jack County. In addition, timing differences between the gas and power markets, changes in weather patterns, unit outages, supply curtailments, and changing market prices will all have an impact on the volume of natural gas used versus what was forecast.
- In addition to the firm storage contracts, all of the current park and loan contracts are non-firm and provide Brazos with added flexibility for daily operations.

Supply

- Based on previous operational and commercial market experience, a maximum of 100,000 MMBtu/day month-ahead and 100,000 MMBtu/day day-ahead was maintained to be a safe limit to stay within for natural gas procurement. Recently though, daily natural gas purchases have reached well over 150,000 MMBtu/day without difficulty in procurement. Due to this, ACES is comfortable in leaving over 100,000 MMBtu to be secured on a daily basis.

6 Recommendations/Actions Items

- ACES recommends the Monthly Baseload Supply amounts for 2021 contingent on market dynamics, which will minimize any gas supply and reliability concerns. In order to cover any potential changes in the market, ACES will need authorization to secure volumes up to 30,000 MMBtu/day on a monthly baseload basis. This gas will not be purchased until the month prior during bidweek and will keep the daily purchases to a manageable, reliable level.

Requested Monthly Volumes to be executed during bidweek of preceding month:

- Term: January 2021 – 0 MMBtu/day
- Term: February 2021 – 0 MMBtu/day
- Term: March 2021 - 0 MMBtu/day
- Term: April 2021 - 0 MMBtu/day
- Term: May 2021 - 0 MMBtu/day
- Term: June 2021 – 30,000 MMBtu/day
- Term: July 2021 – 30,000 MMBtu/day
- Term: August 2021 – 30,000 MMBtu/day
- Term: September 2021 – 0 MMBtu/day
- Term: October 2021 - 0 MMBtu/day
- Term: November 2021 - 0 MMBtu/day
- Term: December 2021 – 0 MMBtu/day

Figure 7. Natural Gas Supply Plan

Proposed 2021 Gas Supply Plan (MMBtu/d)									
Month	Projected Avg. Daily Consumption (ADC)			Targeted Baseload Supply		Procurement Strategy			
	Jack County	Johnson County & Miller	Total	Pct. of Jack County ADC	Volume	Existing Long-term Baseload	Targeted Seasonal Baseload	Monthly Baseload	Avg. Daily Purchase / (Sale)
		[1]							
January	48,889	5,751	54,640	0%	-	-	-	-	54,640
February	34,599	4,688	39,287	0%	-	-	-	-	39,287
March	11,677	363	12,040	0%	-	-	-	-	12,040
April	8,262	833	9,095	0%	-	-	-	-	9,095
May	28,927	2,406	31,333	0%	-	-	-	-	31,333
June	119,400	17,642	137,044	0%	-	-	-	30,000	107,044
July	47,461	5,991	53,451	0%	-	-	-	30,000	23,451
August	62,264	11,735	73,998	0%	-	-	-	30,000	43,998
September	48,423	3,917	52,340	0%	-	-	-	-	52,340
October	3,234	95	3,329	0%	-	-	-	-	3,329
November	17,208	6,006	23,214	0%	-	-	-	-	23,214
December	40,528	6,234	46,762	0%	-	-	-	-	46,762

[1] The Johnson County and Miller plants are both served by transportation service agreements with Atmos Pipeline Texas, Energy Transfer Fuels, and Enterprise Pipeline. These agreements allow for the transfer of deliveries between these two plants. For this reason the supply of these two facilities is considered on a combined basis.

2. On October 31, 2021, the Energy Transfer firm transportation agreement will terminate. Leading up to the expiration, ACES recommends analyzing this contracts as well as revisiting the Enterprise firm transportation contract to determine which, if any, contracts will be needed to reliably operate both units at Jack County. With the improvements in capacity from Worsham Steed, it may be possible to reduce or eliminate the firm transportation contracts. This would still allow for reliable operations at Jack County while savings Brazos fixed monthly demand charges.

Appendix A: Current Contracts

Current NAESB & Gas Annex Contracts

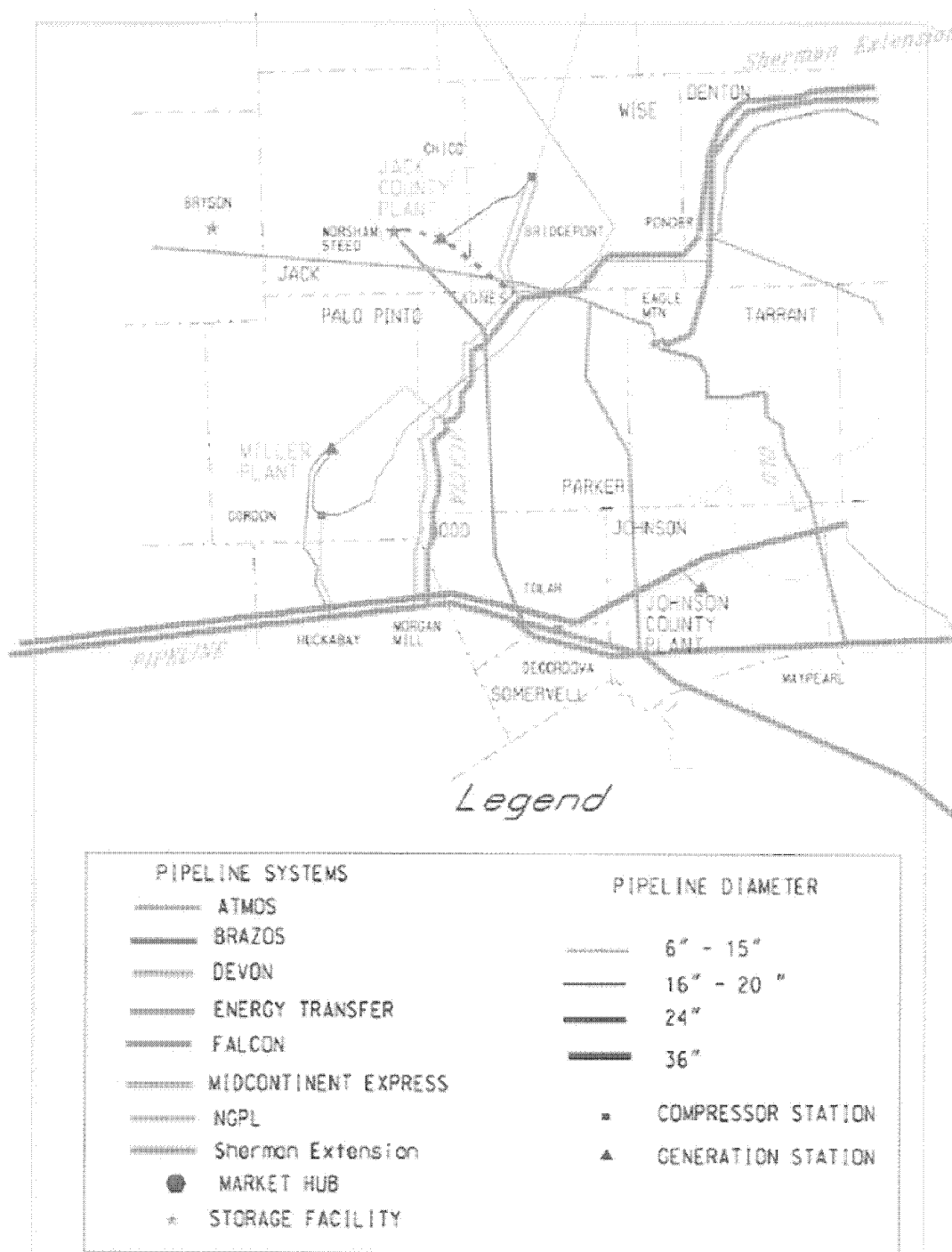
Centerpoint Energy Services, Inc.	NAESB
Chesapeake Energy Marketing	NAESB
CIMA Energy	NAESB
Cimarex	NAESB
ConocoPhillips	NAESB
Devon Gas Services	NAESB
Enbridge Marketing	NAESB
Energy Transfer Fuels	NAESB
EnLink Gas Marketing	NAESB
Enstor Energy Services, LLC	NAESB
Enterprise Products Operating	NAESB
ETC Marketing	NAESB
Koch Energy Services, LLC	NAESB
Luminant Energy	NAESB
Macquarie Energy	NAESB
Mercuria Energy America, Inc.	NAESB
Munich Re Trading LLC	NAESB
National Energy & Trade	NAESB
NJR Energy Services	NAESB
NorTex Trading and Marketing	NAESB
Occidental Energy Marketing, Inc	NAESB
Sequent Energy Management	NAESB
Shell Energy North America	NAESB
Targa Gas Marketing	NAESB
Tenaska Marketing Ventures	NAESB
Total Gas & Power	NAESB
Twin Eagle Resource Management	NAESB
Wells Fargo Commodities	NAESB
EDF Trading North America	Gas Annex
JP Morgan	Gas Annex

Storage and Transportation Contracts

Hill Lake	Storage
Worsham Steed Storage	Storage
Energy Transfer Fuels	Firm Transportation
Enterprise Pipeline	Firm Transportation
Worsham Steed	Firm Transportation
Atmos Pipeline - Texas	Interruptible Transportation
Energy Transfer Fuels	Interruptible Transportation

Appendix B: Brazos Pipeline Map

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Appendix C: Brazos Electric's Natural Gas Fired Generation

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Facility	Summer Capacity (MW)	Heat Rate (Btu/kWh)	Pipeline Connections	Type
RW Miller #1	75	11955	Atmos, ETF, Enterprise	Steam Turbine
RW Miller #2	120	10215	Atmos, ETF, Enterprise	Steam Turbine
RW Miller #3	208	10279	Atmos, ETF, Enterprise	Steam Turbine
RW Miller #4	115	11343	Atmos, ETF, Enterprise	Combustion Turbine
RW Miller #5	104	11816	Atmos, ETF, Enterprise	Combustion Turbine
Johnson County	265	7610	Atmos, ETF	Combined Cycle
Jack County #1	510/610*	6,982/7,224*	ETF, Enlink, Enterprise, Worsham Steed	Combined Cycle
Jack County #2	510/610*	6,982/7,224*	ETF, Enlink, Enterprise, Worsham Steed	Combined Cycle

**includes duct firing*

Appendix D: Projected Average Consumption (MMBtu/day)

	Jack County	Johnson County	Miller	Total
Sep-20	102,763	18,629	7,337	128,729
Oct-20	49,180	15,207	12,553	76,940
Nov-20	45,766	11,775	6,382	63,922
Dec-20	68,518	10,627	5,173	84,318
Jan-21	72,899	15,287	10,794	98,980
Feb-21	68,427	15,652	9,094	93,172
Mar-21	17,882	1,338	4,338	23,558
Apr-21	13,805	8,885	2,681	25,371
May-21	24,165	10,261	4,421	38,847
Jun-21	77,722	15,878	20,127	113,727
Jul-21	123,800	26,143	45,913	195,857
Aug-21	146,603	34,852	78,291	259,746
Sep-21	82,412	16,066	21,248	119,725
Oct-21	16,261	0	8,314	24,575
Nov-21	37,748	10,889	3,804	52,441
Dec-21	57,581	11,414	3,273	72,269
Jan-22	61,979	15,621	10,524	88,124
Feb-22	57,621	15,630	10,437	83,687
Mar-22	14,519	7,792	3,635	25,947
Apr-22	10,762	3,823	1,042	15,627
May-22	19,857	8,320	2,423	30,601
Jun-22	61,480	17,079	17,332	95,892
Jul-22	101,595	27,497	39,716	168,808
Aug-22	128,873	34,476	71,370	234,719
Sep-22	60,437	14,784	18,545	93,766
Oct-22	27,325	0	5,068	32,393
Nov-22	26,825	8,619	2,224	37,668
Dec-22	39,805	8,737	2,502	51,043
Jan-23	53,665	16,380	11,590	81,634
Feb-23	50,896	16,739	11,425	79,060
Mar-23	17,172	6,841	1,614	25,627
Apr-23	17,032	2,469	567	20,068
May-23	18,272	6,416	1,480	26,168
Jun-23	51,966	15,191	16,122	83,280
Jul-23	94,162	25,503	38,678	158,343
Aug-23	114,950	32,571	63,765	211,286
Sep-23	51,783	13,617	16,791	82,191
Oct-23	24,678	0	4,620	29,298
Nov-23	21,151	7,954	1,756	30,861
Dec-23	28,363	6,997	729	36,089
Jan-24	52,771	17,865	12,319	82,954
Feb-24	48,003	17,502	10,968	76,473
Mar-24	18,503	5,942	1,779	26,224
Apr-24	17,275	5,189	593	23,057
May-24	19,566	7,430	1,979	28,975
Jun-24	47,581	15,286	13,884	76,751
Jul-24	91,634	25,881	39,076	156,592
Aug-24	104,429	30,145	55,957	190,531
Sep-24	42,271	13,024	13,060	68,355
Oct-24	28,295	0	1,933	30,228
Nov-24	28,810	6,684	1,749	37,244
Dec-24	28,589	7,142	2,429	38,161

Appendix E: BRAZOS PGM YARD MAP (to Jack Units)

